# CAUSES OF MATERNAL MORTALITY AT A TERTIARY TEACHING HOSPITAL IN JAKARTA, INDONESIA: A NINE-YEAR RETROSPECTIVE SURVEY

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**Abstract.** Maternal mortality ratio (MMR) in Indonesia still remains high (305/100,000 live births) despite efforts to decrease maternal deaths and even higher in tertiary care hospitals. A retrospective study of maternal death cases in Cipto Mangunkusumo Hospital (CMH), a tertiary teaching and national referral hospital in Jakarta, was carried out from 2008 to 2016 to identify causes of maternal death, defined as deaths during pregnancy, childbirth or puerperium. Average maternal mortality in CMH was 661/100,000 live births, with direct obstetric deaths the leading cause (59.8%) and preeclampsia-eclampsia the most frequent group (39%). Indirect obstetric deaths (42.2%) were due to pre-existing conditions, cardiac disease and HIV/AIDS being the most common causes. In conclusion, the most common cause of maternal death at CMH was hypertensive disorders in pregnancy and indirect obstetric causes. These findings should assist in developing health management policies at CMH to address these issues.

**Keywords:** developing country, maternal death, maternal mortality, preeclampsia, tertiary care hospital

## INTRODUCTION

Maternal deaths constitute a devastating event of global interest, initially reflected in the Millenium Development Goals and updated in the 2030 Sustainable Development Goals (United Nations, 2018). In addition to being an indicator of healthcare, maternal mortality is also an indicator of a country's development and gender equality (Nour, 2008). Despite various efforts to reduce maternal deaths, an estimation of Indonesian maternal mortality ratio (MMR) is 305 deaths/100,000 live births (Statistics Indonesia, 2016). This ratio is high compared to neighboring countries in Southeast Asia, such as Malaysia (24 deaths/100,000 live births), Brunei Darussalam (60 deaths/100,000 live births), and the Philippines (221 deaths per 100,000 live births) (ASEAN Secretariat, 2017). The «classical triad» causes of maternal death previously reported by the Indonesian Ministry of Health are bleeding, eclampsia and infection (Indonesian Ministry of Health, 2008). However, current reports on causes of maternal deaths in the country show an

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increase in the indirect causes of death (38.5%), followed by obstetric hemorrhage (30.1%), hypertension in pregnancy (25.5%), and infection (5.9%) (Statistics Indonesia, 2016).

Cipto Mangunkusumo Hospital (CMH) is a tertiary teaching and national referral hospital in Jakarta, capital of Indonesia. MMR and cases in referral hospitals differ from the general population, with indirect causes accounting for maternal deaths (Goswami *et al*, 2013). However, limited data are available regarding trends and causes of maternal death in hospitals in Indonesia, despite governmental programs and efforts to reduce maternal deaths (Ocviyanti *et al*, 2016). Here, a nine-year retrospective study was undertaken to identify causes and trend of maternal deaths in CMH, Jakarta.

## MATERIALS AND METHODS

### Study site and design

CMH, located in Jakarta, is a tertiary teaching hospital of the Faculty of Medicine, University of Indonesia, and also serves as the national referral hospital of Indonesia. Jakarta, the capital city of Indonesia, has a population of 10,374,235 in 2017 (Indonesian Ministry of Health, 2018). CMH has been accredited by the Joint Commission International since 2013. Medical doctors attend all deliveries in CMH.

A retrospective review of all maternal death cases at CMH between January 2008 and December 2016 was undertaken using data retrieved from maternal death reports and medical records. All maternal death cases were immediately audited internally at the Department of Obstetrics and Gynecology, CMH. The following factors were recorded: maternal age, parity, trimester at hospital admission, diagnosis at admission, referring healthcare facility, mode of delivery, pregnancy status at death, and diagnosis at death.

The study protocol was approved by the Ethical Committee for Medical Research, Faculty of Medicine, University of Indonesia (Ethics Committee reference no. 696/UN2.F1/ETIK/VII/2017).

### Classification of maternal deaths

Maternal deaths were classified according to WHO Application of ICD-10 to deaths during pregnancy, childbirth, and the puerperium (WHO, 2012) and the classification of maternal deaths was conducted by both authors (obstetricians and gynecologist). In cases of complications or multiple diagnoses due to a primary condition, primary condition was chosen as cause of death, *viz* maternal death caused by pulmonary edema due to preeclampsia classified as hypertensive disorders in pregnancy.

### Statistical analysis

Data obtained are presented as descriptive data and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0 (IBM Corp, Armonk, NY). Hospital maternal mortality is presented as number of maternal deaths/100,000 live births.

## RESULTS

From January 2008 to December 2016, maternal deaths ($n$ = 159) at CMH were mainly 26-35 years of age, admitted to CMH at the third trimester of pregnancy, and multigravida; and occurred in the postpartum period (Table 1). The most frequent mode of delivery was by cesarean section. Based on WHO ICD-MM nine classifications of causes of maternal deaths (WHO, 2012), the survey results were as follows (in decreasing order of frequency):

Table 1
Maternal and obstetric characteristics of maternal deaths at Cipto Mangunkusumo Hospital, Jakarta, Indonesia (January 2008 - December 2016).

| Characteristic | Number (%) ($n$ = 159)* |
|---|---|
| Age (years) | |
| <20 | 1 (1) |
| 20-25 | 29 (18) |
| 26-35 | 97 (61) |
| 36-40 | 26 (16) |
| >40 | 6 (4) |
| Gravida | |
| Primigravida (1) | 58 (37) |
| Multigravida (2-5) | 94 (59) |
| Grand multigravida (>5) | 7 (4) |
| Trimester on admission | |
| First trimester | 2 (1) |
| Second trimester | 19 (12) |
| Third trimester | 105 (66) |
| Postpartum | 33 (21) |
| Pregnancy condition at death | |
| Pregnant | 27 (17) |
| Postpartum | 132 (83) |
| Mode of delivery ($n$ = 132) | |
| Abortive outcome | 4 (3.5) |
| Vaginal | 33 (25) |
| Assisted vaginal | 8 (6) |
| Cesarean section | 85 (64) |
| Perimortem cesarean section | 2 (1.5) |

*Unless specified.

group 7, non-obstetric complications, 70 (44%); group 2, hypertensive disorders in pregnancy, childbirth, and puerperium, 62 (39%); group 3, obstetric hemorrhage, 18 (11%); group 4, pregnancy-related infection, 5 (3%); group 1, pregnancies with abortive outcome, 3 (2%); group 9, coincidental causes, 1 (1%); and group 5, other obstetric complications, group 6, unanticipated complications of management and group 8, unknown/undetermined, all 0 (0%). However, based on primary diagnosis at CMH, the major direct cause of maternal death was preeclampsia-eclampsia, followed by postpartum hemorrhage, while the most frequent pre-existing conditions were cardiac disorders and HIV/AIDS (Table 2). The majority (55%) of maternal deaths occurred among referral cases from secondary care hospitals, 78% of whom did not have routine antenatal care. The average number of maternal deaths and deliveries per year was 18 and 2,672 respectively. During the survey period,

Table 2
Causes of maternal death based on primary diagnosis at Cipto Mangunkusumo Hospital, Jakarta, Indonesia (January 2008 - December 2016).

| Diagnosis | Number (%) ($n$ = 159) |
|---|---|
| Direct obstetric death | 94 (59) |
| Preeclampsia-eclampsia | 62 (39) |
| Postpartum hemorrhage | 14 (9) |
| Emboli | 6 (4) |
| Intrauterine infection | 5 (3) |
| Third-trimester bleeding | 4 (2) |
| Pregnancy with abortive outcome | 3 (2) |
| Indirect obstetric death | 64 (40) |
| Cardiac disorders | 18 (11) |
| HIV/AIDS | 10 (6) |
| Pneumonia (including tuberculosis) | 9 (6) |
| Malignancy | 8 (5) |
| Dengue infection | 6 (4) |
| Acute fatty liver in pregnancy | 6 (4) |
| Neurological disorders | 3 (2) |
| Systemic lupus erythematosus | 3 (2) |
| Hematological disorders | 1 (1) |
| Death during pregnancy | 1 (1) |
| Trauma | 1 (1) |

average hospital maternal mortality was 661/100,000 live births. The number of maternal deaths peaked in 2014, but overall maternal mortality index at CHM remained basically unchanged from 2008 to 2016 (and even showed a slightly increasing trend) (Fig 1).

## DISCUSSION

Prior to January 2014, all cases could be admitted to CMH from secondary care and district hospitals regardless of the district, but as of January 2014, the Indonesian National Health Insurance was implemented via the Presidential Regulation No 111 by 2013 (Government of Indonesia, 2013) and CMH could only accept referrals from secondary care and district hospitals in Jakarta and surrounding areas, resulting in decreased numbers of live births at CMH (number of live births/year ranged 2,314-3,415 from 2008 to 2013 while this number was <2,000 live births/year from 2014 to 2016).

However, the number of maternal deaths did not differ substantially and the average maternal mortality at CMH from 2008 to 2016 (661 deaths/100,000 live births) was double that of the national average rate (305 deaths/100,000 live births) (Statistics Indonesia, 2016). As CMH is a national referral and a tertiary teaching hospital, referral cases tended to complicated and not able to be managed at lower-level facilities, especially since the implementation of the Indonesian National Health Insurance system. Higher rates of morbidity and mortality have been reported in other tertiary hospitals in the country (Murthy *et al*, 2013; Kaur *et al*, 2015). Causes of death at tertiary care hospitals also differ from community hospitals (Paul *et al*, 2011; Yego *et al*, 2013), owing to factors such as high load of complicated cases, mismanagement at

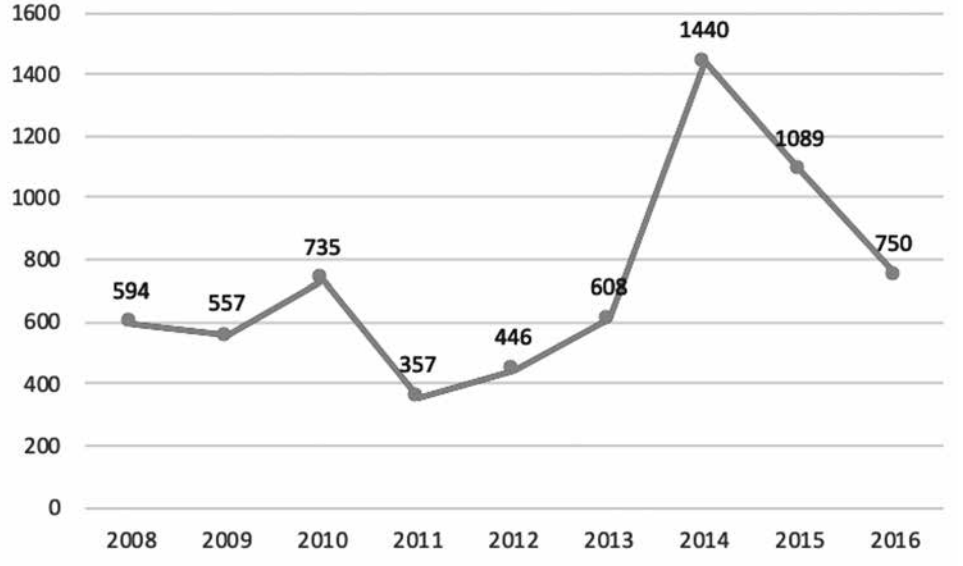


Fig 1-Annual hospital maternal deaths per 100,000 live births at Cipto Mangunkusumo Hospital, Jakarta, Indonesia (January 2008 - December 2016).

the source of referrals and lapses in the referral chain, thereby contributing to the higher MMR than the national average (Pandey *et al*, 2014). Majors factors contributing to maternal mortality at CMH were in line with those reported by the National Research Council (2013): in the puerperium period (61.59%), gestation >20 weeks (18.24%), intrapartum (12.95%), and gestation <20 weeks (7.22%). These findings are consistent with previous studies in tertiary care hospitals in Gambia (Idoko *et al*, 2017) and Nigeria (Mbachu *et al*, 2017).

The most frequent cause of maternal death in CMH, preeclampsia-eclampsia with its spectrum of complications, such as pulmonary edema, cardiac dysfunction, and pneumonia, might stem from failure to detect high blood pressure disorders during antenatal care at lower-level care facilities thereby delaying referrals. Ocviyanti *et al* (2016) reported 91.4% of preeclamptic cases referred to CMH have regular antenatal care but 78.4% were performed by midwives or at primary health care facilities, while only 8.8% of deaths are due to obstetric hemorrhage as lower-level care facilities are able to manage this complication through availability of uterotonics and early management of postpartum hemorrhage. Education on preeclampsia prevention and detection should be improved among healthcare providers), including identifying high-risk groups in low-resource settings through measurement of blood pressure (>30 mmHg systolic or 15 mmHg diastolic), and noting excessive weight gain during pregnancy (Rulisa *et al*, 2015). Low dose aspirin and calcium may be administered to high-risk groups to prevent preeclampsia (American College of Obstetricians and Gynecologists, 2013).

At present, primary providers of antenatal care in Indonesia are midwives (87.8%), and only 11.8% are physicians (Indonesian Ministry of Health, 2013). The present study finds the majority of patients referred to CMH from secondary health facilities did not receive routine antenatal care. As most mothers who died in CMH came in the third trimester of pregnancy and postpartum period, this raises the need for early detection of pre-existing conditions and pregnancy complications during antenatal care and referral to tertiary care facilities. Although WHO South-East Asia Regional Office reported coverage of pregnancy care is 85% (WHO SEARO, 2017), this indicates an adequate coverage of antenatal care service but of a quality not be up to the required standards. A Joint Committee on Reducing Maternal and Neonatal Mortality in Indonesia stated midwives should be trained to recognize obstetric emergencies and complications and to arrange for referrals (National Research Council, 2013).

These findings highlight an improvement of antenatal care as one of the essential components for reducing maternal deaths in Indonesia. The following recommendations are suggested: (1) evaluation of appropriateness of pregnancy, (2) identification of pre-existing conditions, (3) early detection of pregnancy complications and prompt referral, (4) recommendation of termination of pregnancy if carrying to term is contraindicated, and (5) every pregnancy should be examined at least once by a physician to detect pre-existing conditions and arising pregnancy complications.

A previous study in a rural area in Indonesia reported poor organization and inadequately trained personnel in health care facilities contribute to 93 and

100% of maternal deaths respectively (Mahmood *et al*, 2018). Geographical factors and problems at personal or family levels, such as lack of recognition of the seriousness of pregnancy complications and financial difficulties, also contribute to 50% of maternal death cases (Mahmood *et al*, 2018). Improvement in these features is of equal importance in reducing maternal mortality, as well as that in quality and access of antenatal care and safe delivery by trained healthcare professionals, was addressed in the Indonesian National Medium Term Development Plan 2015-2019 (Indonesian Ministry of National Development Planning, 2014).

It is worth noting that in the present study indirect obstetric causes contributed to nearly half of maternal mortality and this phenomenon is increasingly common in other Southeast Asia (15.8%) and developed countries (27.5%) (Say *et al*, 2014). This aspect of the problem should not be neglected.

There are two major limitations to the study. Firstly, there were no data regarding antenatal visits and pre-hospital management and conditions prior referral, as antenatal data were mainly recorded in the Mother and Child Health Handbook, which was not available in the hospital medical record. Such information is invaluable for providing a more comprehensive understanding of the problem of hospital maternal mortality, and further research on the quality of obstetric, antenatal and emergency obstetric care in Indonesia is needed. Secondly, the results may not be directly applicable to all levels of hospitals at large in the country, or even to other tertiary care hospitals. To the best of our knowledge, this is the first report on maternal deaths in a tertiary hospital in Indonesia using the new WHO ICD-MM classification (WHO, 2012). Although the results were limited in scope, they should serve as baseline data for further research into healthcare interventions especially in antenatal care to reduce maternal deaths in hospitals and communities in Indonesia.

In conclusion, at a tertiary teaching and national referral hospital in Jakarta, maternal mortality was higher than the general population due to the severity of complications in referral pregnancy cases, divided nearly equally between direct and indirect obstetric causes. Further research on the quality of obstetric, antenatal and emergency obstetric care, should help to provide a more thorough insights into the problems and thereby reduce maternal deaths in Indonesia.

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## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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